GEOSPATIAL MAPPING HELPS TO BETTER UTILIZE POLICE RESOURCES

Background

GeoDimensional Decision Group LLC (GeoDD) was engaged to provide Metro City a better strategy for utilizing police resources. Our increasingly complex society demands increasingly sophisticated yet cost-efficient police protection for its citizens. Since the 1970s, successful programs and technologies have been implemented that capture and process information and statistics about crime and criminal events. However, those successes have primarily focused in areas of existing or increasing crime activity. There has been less focus on predicting criminal activities outside of these historical patterns. The Metro City Police Department recognized that where and how often a type of crime occurs can be dynamic and changing. When a very concentrated effort is applied to fighting crime in an area based on existing data, often there is local success but that same type of criminal activity may resurface elsewhere in the community. In order to close this gap, GeoDD was given three tasks.

Task 1: **Diagnose current actions with police resource allocations** – Analyze the activities in current resource allocation and utilization of police resources and discern areas for improvement in reducing criminal events.

Task 2: **Provide city-wide zones of vulnerability** – Identify, through the use of big data, common denominators of crime hot spots, the victims, and the criminals that carry out these activities. This requirement is focused to better characterize, understand and classify the crime site in order to deter its occurrence from popping up at a new location.

Task 3: **Provide means to measure improvement** – Make transformational improvements in public safety and provide performance measures that will translate into positive return-on-investment computations showing more efficient and effective policing with limited or reduced use of police resources.

CHALLENGE

Numbers: Metro City is one of the most populous cities in the state with nearly 2.2 million citizens living within its city limits. The Metro City population is multicultural and made up of 25% Whites, 26% Hispanic, 24% Blacks, 11% Asians, with the remaining peoples from around the world. While Metro City is considered relatively safe, it does have a significant number of crimes including drug related violence, theft, burglaries and assault. Sprawling over 450 square miles and within proximity to major illegal drug exporting nations, law enforcement resources are stretched to the limits as officers respond and investigate a total of 1,312 violent and 7,632 non-violent crimes within 12 divisions just in the month of June.

Consequence: Traditional deployment of resources at their current levels can't keep up with the demand to manage the dynamic characteristics of crime on the streets and the estimated 40 percent of potential criminal activity being prevented because of an effective but tenuous relationship with the community at risk. Primary and secondary costs associated with these crimes directly affect individuals/households, the commercial sector/commerce and the public sector/society. Additional fiscal pressures include renewed public outcry demanding better anticipation of crime, the consequences of crime on health care costs, plus victim support and insurance claims. Furthermore, negative publicity leads to reduced tourism, lost economic growth, lowering property values, and the increased costs associated with prosecution, court and incarceration of criminals.

Current resource utilization approach: Technologies available to law enforcement have had measured success in departments attempting to be more effective in combating crime and understanding what motivates criminals. Over the years, computer-aided enforcement solutions, such as COMPSTAT, focus on strategic control from collection and feedback of crime data and is still used today. The more recent system, PredPol®, uses algorithms that help forecast highest risk times and places for occurrences of future crime within small geographically significant areas of interest. These link and display crimes on maps to help officers to better visualize where crimes have occurred and somewhat predict trends as to where future crimes might take place.

Metro City's current actions: An interdisciplinary Law Enforcement Resource Allocation Team (LERAT) was formed consisting of the Assistant Police Chief, lead resource allocation specialist, lead data analyst, State demographer, geospatial expert, a social worker, and police officers from each of the city's police districts. The Team also brought in representation from the police unions, grass root community organizations, academics and business leaders from each sector of the service areas. LERAT created and executed a plan that included identification of research objectives, oversight protocols, stakeholder outreach, data review, data processing, analysis and final reporting. The Team discovered that, while the program helped create a collective team approach to better evaluate potential crime, the results when compared to the established program goals were only marginally successful as summarized below.

Early Results and the Challenge. The program was launched on December 1, 2012. Officers were to provide regular reports (daily and weekly) of potential criminal activity within their jurisdictions. After six months, a formal assessment of the program showed that there did not appear to be a significant reduction in use of resources (people and materials) and that the predictive aspects of the program was somewhat positive, but at an increased resource cost. The conclusion was that the causative entities exacerbating resource budget use could not be clearly identified and that the predictive measurable instances of crime were still elusive. "We can't solve the problem if we don't understand the cause," says a Metro City police spokesperson. "We're not getting anywhere on our own."

SOLUTION

LERAT sought GeoDD's help. Unlike other firms involved in determining how best to leverage law enforcement resources, GeoDD not only uses electronic maps, i.e. hot spot maps to report ***historical patterns*** associated with crime location but also employs sophisticated geospatial analysis to bring ***real-time*** definition to any problem that ultimately and directly impacts resource utilization. Geospatial analysis adds physical location to the mix and allows multiple layers of real-time, not just historical, data for analysis. Included in the real-time data was officers' intuition about suspected environments. This approach allowed GeoDD to connect dots between layers of data (i.e., three-dimensionally that includes both hard and soft data) where others have not.

The initial LERAT study provided an analysis by ZIP Code which for the most part showed crimes were being committed as expected in hotspots around the city equally distributed through 12 different police districts east to west, with a greater density on the north side of Interstate 59 and a lessor density on the south side of the service area. GeoDD, using its ***KNOW***System™, mapped the typical (hard) datasets that included location of crime events, historical hot spot crime areas, population and high opportunity targets by Census tract acquired from the U.S. Census Bureau. GeoDD analysts also interviewed officers to collect additional soft data like environmental characteristics of high crime areas within the boundaries of their beat. Officers were provided an intuition app for their phones that allowed them to

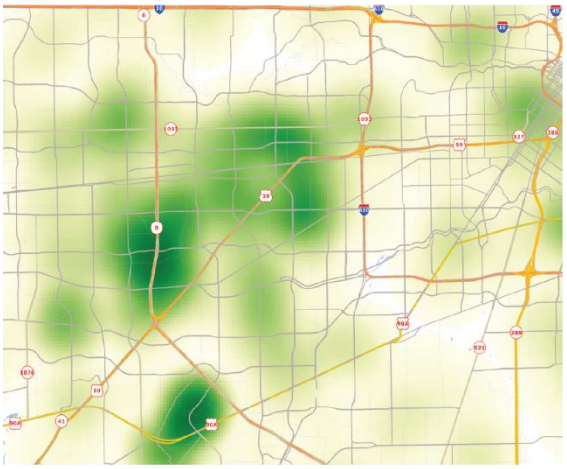
easily enter data as to how they were feeling about a given situation while on the site. This intuition collection app provided a new layer of information that when normalized and quantified provides greater optics associated with the overall operational picture on the ground. Finally, GeoDD analysts created vulnerability index overlays of the city which included a one county buffer around the city that exposed population and demographic insights specific to the study area as well as insights from influences that were spatially adjacent to it. When the data was assembled and integrated the Metro City PD had a more detailed and accurate situational awareness of their policing environment as well as the bordering jurisdictions that were possibly influencing it. It is worth noting that during the deployment of the ***KNOW***System™ approach an additional benefit was realized. A neighborhood strengthening function and an adjunct to Community Policing was created and embraced by the citizens in the neighborhoods at greatest risk.

The resulting GeoDD analysis identified key implications for Metro City PD to consider and implement as part of their strategic policing mission plan going forward. These include:

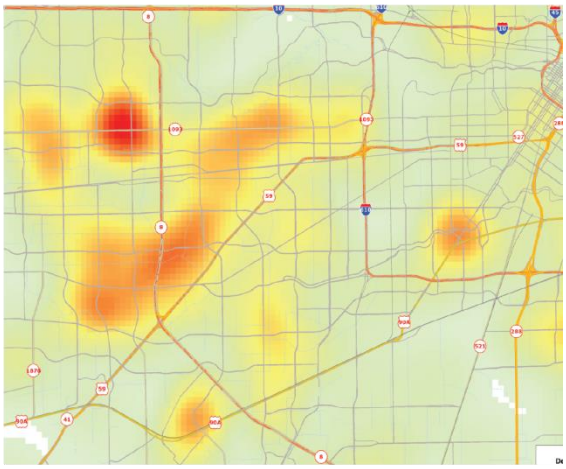
1. The enormous data capacity that GeoDD analysts processed and used in the situational assessment resulted in 1) greater precision making policing more efficient and effective, maximizing all resource use; 2) validating patterns for the crimes; 3) reducing the charge of racial profiling; and 4) providing higher confidence in deterring future crime.
2. An ability to formulate actionable 'what if' questions, along with questions not previously possible because of limited situational awareness and poor optics was now possible: 1) Providing the 'what if' answers helped optimize deployment of resources (personnel and materials) by clearly understanding needs; 2) With the newly formed comprehensive database of contextual awareness, with its expanded set of inputs (time, place, days of week, types of crime, criminal profile, etc.), facilitated questions about potential crime hotspots and patterns of crime.
3. Engaging human intelligence through involving a wide range of stakeholders (e.g., community and business) improved understanding the crime situation and the criminal. By engaging community partnerships, plus creating and sharing of responsibility to make neighborhoods safer resulted in a reduced need for police.
4. Integration of significant tangible and intangible data sets which allowed for identification of potential crime incubation sites. This directly led to proactive steps for working with the community and businesses to change the dynamics of problem sites. It also helped focus funds and resources to needed areas, an expanded aspect of community policing to community re-development.

5. The new partnership with the public allowed a positive and unbiased exploitation of all the information. See graphics and note the focused 'hot' spots on the GeoDD map.

Predictive HotSpot Map
(Traditional Methodology)



Predictive HotSpot Map
(GeoDD Methodology)



The map on the left shows predictive hotspots for the city using traditional data sets and analysis resulting in a more widespread area of concentrated crime. The map on the right produced using the ***KNOW***System™ has implemented a more comprehensive collection of data sets, attributes and spatial granularity to more specifically identify the zone with the highest concentration of predictive crime potential and that is in need of additional resource deployment.

IMPACT

Crime Rate Reduction Target Near. Over the past six months LERAT worked closely with GeoDD to identify, access and integrate the additional data sets needed to support a more comprehensive view of the crime cycle. By working with neighboring jurisdictions and visualizing geospatially the patterns, routes of criminal progression from origin to execution and how officer resources were being deployed, a framework was established for making measurable changes going forward. The framework was quickly adopted and soon became part of the regular CompStat briefings held within the department. Quickly after launch, it became clear that by having a broader understanding of all the decisions being made about resource allocation seemed to predicting where actual crimes were being facilitated. Officers started to get a sense that what their gut has been telling them all along now was being backed up with science. While the rate of crime remained constant, the costs associated with providing adequate policing were reduced by 15% over the next six months. Not only did results from the original program continue to improve, but also the special interventions within the community through aggressive and inclusive outreach programs began to show significant results. Of 1,312 violent and 7,632 non-violent crimes within 12 divisions for the month of June of the previous year, a consistent reduction of rate of 5% in violent crimes and 7.3% in non-violent crimes was being directly attributed to the new program put in place of the last 12 months. Hours spent related to direct execution of policing and administrative costs was down nearly 11% overall. With another quarter in 2015, it appears that LERAT will exceed its target and reduce an additional 5% across all reporting sectors. Additionally, some of the

cost savings continue to be rolled into proactive community outreach programs that are expected reduce the overall rate of new crime in the future.

Recommendation. Develop a system that will completely process not only currently expected law enforcement inputs (arrest reports, intake interviews, 911 calls, for example), but also identify and utilize non-traditional inputs. Such additional data may include environmental factors, social factors, land use factors, health factors, and economic factors, along with changes in population. Data can include changes in population densities, local geographic conditions (such as lighting, sight lines, topography, housing, building uses, "broken windows", etc.), business and construction activity, educational programs, and changes in the types of crime in a locale. Importantly, data around behaviors, attitudes, local norms, and other people-related attributes should be considered.

Additionally, critical policing data from criminals and victims should be added to the analyses to develop a much more robust understanding of emerging crime patterns. With this expanded wealth of data, the concern about prejudicially identifying a specific group, or "profiling," is greatly reduced. Identification is fact-based and focuses on a clear array of trends within a specific situation.